



SPISE 2024 Final Report

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This report on the 13th annual Student Program for Innovation in Science and Engineering (SPISE) contains an overview of the program, a list of the students and their sponsors, the application process, the SPISE environment and curriculum, the career seminar speakers, the instructors and teaching assistants, the final project presentations, the awards, and photographs of the students.

Overview of SPISE

SPISE is an initiative of the Caribbean Science Foundation (CSF) to help address the low numbers of Caribbean students pursuing advanced degrees in science and engineering, and to groom the next generation of science, engineering, technology and business leaders in the Region.

SPISE 2024 was held for 5 weeks from 7th July to 10th August 2024. On Saturday 6th July 2024, 20 students from 8 Caribbean islands, namely Antigua, Barbados, Belize, Guyana, Jamaica, St. Lucia, St. Vincent, and Trinidad (see photo below) arrived at the University of the West Indies – Cave Hill Campus, Barbados to participate.



SPISE Class of 2024

The SPISE 2024 class comprised 11 female and 9 male students, who are all exceptional in the areas of science and math and are interested in studying and pursuing careers in Science, Technology, Engineering and Math (STEM) related fields. The students' participation in SPISE was supported by the CSF's partners and institutional and individual donations from the Caribbean and the Diaspora. Each student was named as the scholar of their sponsor.

The cost per student to attend SPISE was US\$7,500 which covered student housing, meals, airfare (if applicable), ground transportation, stipends for the instructors and teaching assistants, and partial costs

of lab equipment and supplies. The table below (Table I) shows the list of the SPISE 2024 students and their respective sponsors.

TABLE I: SPISE 2024 Students and Their Sponsors

<i>Honey Advani</i>	<i>SPISE 2024 CIBC Caribbean Scholar</i>
<i>Amariah Brathwaite</i>	<i>SPISE 2024 Central Bank of Barbados Scholar</i>
<i>Hale Fearon</i>	<i>SPISE 2024 Hussey Family Scholar</i>
<i>Daena Fontenelle</i>	<i>SPISE 2024 Eastern Caribbean Central Bank Scholar</i>
<i>Aneira Garibsingh</i>	<i>SPISE 2024 Peter & Jan Boos Scholar</i>
<i>Maliyah Henry</i>	<i>SPISE 2024 PETNA Foundation Scholar</i>
<i>Kailey Ho</i>	<i>SPISE 2024 Linda Su-Nan Chang Sah Scholar</i>
<i>Alvin Htoot</i>	<i>SPISE 2024 Robert Sah & Helen Li Scholar</i>
<i>Rhianne Irving</i>	<i>SPISE 2024 Sagicor Foundation Scholar</i>
<i>Arianna James</i>	<i>SPISE 2024 CSF Scholar</i>
<i>Krishna Mahtani</i>	<i>SPISE 2024 Emera Caribbean Scholar</i>
<i>Johan Nah</i>	<i>SPISE 2024 Caribbean Development Bank & CADSTI-New England Scholar</i>
<i>Arthur Roberts</i>	<i>SPISE 2024 PETNA Foundation Scholar</i>
<i>D'Aundré Samuel</i>	<i>SPISE 2024 Eastern Caribbean Central Bank Scholar</i>
<i>Jonathan Shaw</i>	<i>SPISE 2024 CIBC Caribbean Scholar</i>
<i>Marie-Thérèse St. Clair</i>	<i>SPISE 2024 LUCELEC Scholar</i>
<i>Gianna Stapleton</i>	<i>SPISE 2024 Kerosene Lamp Foundation Scholar</i>
<i>Kennardo Taylor</i>	<i>SPISE 2024 Peloton International Scholar</i>
<i>William Wright</i>	<i>SPISE 2024 Sagicor Life Scholar</i>
<i>Joseph Yeung-Chou</i>	<i>SPISE 2024 Sandy Lane Charitable Trust Scholar</i>

The SPISE Application Process

The SPISE 2024 application process opened on 23rd January 2024. Application forms were available on the CSF website at <https://caribbeanscience.org/spise-2024/> with a submission deadline of 31st March 2024.

To qualify for SPISE, applicants were required to meet the following criteria:

- Enrollment in a high school within the Caribbean for the past 4 years;
- At least 16 years of age but less than 18 years of age on April 1, 2024; and
- Completion of CSEC exams, CAPE exams, O or A level exams, the SAT, or equivalent exams in math and science subjects.

Applicants were required to submit an application package containing:

- Completed SPISE Application Form
- Four essays on specific topics
- Official high school transcript for 4 most recent Forms/Grades

- Copy of CAPE/Associate Degree 1st semester grades or copy of report card/transcript
- Copy of CSEC grades, CAPE, and/or SAT scores
- Math Teacher letter of recommendation
- Science Teacher letter of recommendation
- Passport-type photograph
- Copy of passport identification page

Upon closure of the application window on 31st March 2024, the applications were assembled and organized by CSF administrative staff and then sent to a panel of external reviewers comprising academic and industry professionals from both the Caribbean and the Diaspora, who had no relationship or connection with the subset of students whose applications they were asked to review. Each application was evaluated by the assigned reviewers and given a score. Based on these scores, the input of the CSF's Executive Directors, and available donations, the SPISE 2024 class was selected.

The SPISE Environment & Curriculum

SPISE is a learning environment in which students are trained to think logically and critically and to develop analytical and logical problem-solving approaches in several disciplines. Rote learning is discouraged. Thus, while obtaining the correct answers to problems and questions is important, critical and logical thinking, robust methodology and analytical problem-solving approaches are more highly valued at SPISE. The focus is on understanding the concepts and fundamental principals in each discipline, in order to gain enough mastery to apply these fundamentals to finding solutions for new, complex problems that have not been encountered before. Thus, a curriculum which challenges the students, builds on previous knowledge and exposes them to new concepts and ideas was developed. The courses in SPISE 2024 were calculus, physics, biochemistry, entrepreneurship, electronics, and computer programming.

On the first official day of SPISE (7th July), the students took diagnostic exams in Calculus, Physics, Biochemistry and Computer Programming, and attended the Welcome Ceremony and two introductory seminars. The results of these diagnostic exams allowed the course instructors to assess the prior knowledge of each student and assign each student to the appropriate course level in Physics and Calculus, either level I (less advanced) or level II (more advanced). The diagnostic exam results also enabled tailoring of the course syllabus as needed for Calculus, Physics, Biochemistry and Computer Programming.

Of the 6 courses, electronics and computer programming comprised primarily hands-on projects. Teamwork is a very important aspect of the SPISE experience and for these courses, students were assigned to teams tasked with working on a specific project. This required each student to work with their team not only during assigned class time, but also after hours and on weekends with their team. Teams were selected to maximize student diversity by country of origin and gender, so that each student would gain as broad an experience as possible in working with diverse team-mates.

Along with theoretical instruction, the Biochemistry course encompassed a practical, hands-on laboratory class. This session comprised an experiment using a simulated enzyme – linked immunosorption assay (ELISA), a widely used immunological method for quantifying levels of a protein

of interest in a biological sample, using antibodies that specifically recognize this protein. For all students, it was their first experience performing this hands-on laboratory technique. After the experiment was conducted, the students were required to write a laboratory report describing the experiment's goal, rationale and background for the experiment, methods, data, results and conclusions.

In addition to the academic curriculum, students were exposed to career seminars. The aim of these seminars was to have successful professionals from the Region as well as from the Diaspora share their academic and career paths and decisions, as well as lessons learned with the students, and to expand the students' network of contacts. Table II shows the list of career seminar speakers. A seminar on best practices in time management skills was also included, as well as workshops on CV content and format, and on strategy, planning and tactics for university applications. In addition, there was a workshop with Dr. Kristen Lee, focused on balancing school/work and life, and handling the stress and pressure of rigorous academic programs. The SPISE 2024 class also took tours to local corporations that provide products based on science and technology, as well as to local places of interest. The corporations included Lenstec (cataract lens manufacturing) and Emera Solar Farms (renewable energy provider).

TABLE II: Career Seminar Speakers

<i>Dr. Jeanese Badenock</i>	<i>Dean of Science & Technology, Senior Lecturer in Organic Chemistry, UWI - Cave Hill</i>
<i>Mr. Nicholas Brathwaite</i>	<i>Founder and Managing Partner, Celesta Capital</i>
<i>Prof. Jay Mandle</i>	<i>Professor Emeritus of Economics, Colgate University</i>
<i>Dr. Dinah Sah</i>	<i>Biotechnology Executive (former Chief Scientific Officer, Voyager Therapeutics); SPISE Director; Co-Executive Director, CSF</i>
<i>Prof. Robert Sah</i>	<i>Professor of Bioengineering, University of California- San Diego</i>
<i>Prof. Cardinal Warde</i>	<i>Professor of Electrical Engineering, MIT; Interim Executive Director, CSF</i>

Dedicated one-on-one meetings between the SPISE/CSF Directors (Dr. Dinah Sah and Professor Cardinal Warde) and the students were held during the final day of SPISE. During this time, students were able to share their perspectives on the program, and the Directors gave their feedback to the students on their performance and offered further advice and guidance on their future plans. Even though these exit interviews were formalized, informal one-on-ones were constant features of the program, with the students engaging the staff throughout the five-week program.

Photos illustrating the activities of the students follow:



Gianna Stapleton (back left), Aneira Garib Singh (back right) and Jonathan Shaw (front left) working on their electronics projects



Joseph Yeung-Chou (back center), Honey Advani (front center), Alvin Htoot (right) examining a cataract lens during the Lenstec Tour



Alvin Htoot (left) and Amariah Brathwaite (right) carrying out an ELISA



Johan Nah (left) and Jonathan Shaw (right) carrying out an ELISA



Arthur Roberts (left) and Marie-Thérèse St. Clair (right) presenting a demonstration of their video game Cave Escape



Arianna James (far left), Johan Nah (left), Jonathan Shaw (right) and Marie-Thérèse St. Clair (far right) presenting their entrepreneurship project Plasthetix, which aims to use recyclable materials and car parts to manufacture prosthetics



Krishna Mahtani (left), Kennardo Taylor (center) and Aneira Garib Singh (right) demonstrating their electronics project Envirosensors, which measures ambient temperature and humidity

The SPISE Staff

The SPISE instructors were from both the Region and the Diaspora, including university professors and lecturers from MIT and UWI - Cave Hill as well as a senior management professional from the biotechnology industry. They fostered a stimulating and positive environment in which the students were encouraged to ask questions and express their thoughts. Several of the instructors have been with SPISE since its inception in 2012. All instructors were briefed on the SPISE philosophy and approach prior to the beginning of SPISE.

In addition to the instructors, the teaching assistants played a vital role. This year there were a total of 6 teaching assistants, who were students at MIT or Columbia University. They assisted the instructors with grading assignments and exams, and held office hours and tutored the students outside of class to supplement the formal lectures. By living in the dorms with the students for the entire duration of the program, their roles also included supervising, mentoring and guiding the students. The names and course affiliations of the teaching assistants and instructors are shown in Table III below.

TABLE III: Instructors and Teaching Assistants

NAME	SUBJECT (S)
TEACHING ASSISTANTS	
<i>Michael Bhopaul</i>	<i>N/A (Head Teaching Assistant)</i>
<i>Jada Dixon</i>	<i>Physics I & Computer Programming</i>
<i>Iana Ferguson</i>	<i>Biochemistry & Entrepreneurship</i>
<i>Kailyn Gustafson</i>	<i>Calculus I & Computer Programming</i>
<i>Macy Hogsett</i>	<i>Calculus II & Physics II</i>
<i>Matthew Wilmot</i>	<i>Electronics</i>
INSTRUCTORS	
<i>Michael Bhopaul</i>	<i>Calculus II</i>
<i>Caleb Bonyun</i>	<i>Physics I</i>
<i>Chris Harper</i>	<i>Entrepreneurship</i>
<i>Andre Husain</i>	<i>Computer Programming</i>
<i>Daniel Monagle</i>	<i>Electronics</i>
<i>Tane Ray</i>	<i>Physics II</i>
<i>Dinah Sah</i>	<i>Biochemistry</i>
<i>David Thorpe</i>	<i>Computer Programming</i>
<i>Joshua Wolfe</i>	<i>Calculus I</i>

SPISE Culmination

On 9th August 2024, the students took part in the SPISE 2024 Final Project Presentations which was an event open to the public. This event gave the students the opportunity to address the audience, demonstrate their abilities to work as teams and display the skills they acquired during SPISE. In the entrepreneurship competition, teams pitched their business plans to ‘investors’ (the audience and judges) and fielded questions from the investors to determine which team would garner the highest ‘investment’. For their computer programming projects, the student teams showcased the video games they had created. In electronics, the students demonstrated the functional electronics systems they had designed. The team format required the students to work collaboratively, highlighting a key skill developed in SPISE.

The evening of 10th August 2024 marked the culmination of the program. The Farewell Banquet and Awards Ceremony was held, and each student received a SPISE graduation certificate from Dr. Dinah Sah, Director of SPISE and Co-Executive Director of the CSF. Many awards were given to the students. For each subject area, students were recognized with the Top Performer Award for performing exceptionally well and consistently demonstrating the highest academic excellence in the course, exceeding academic expectations in the work. Students were also given Most Improved Awards for making tremendous advancements relative to their initial knowledge of the subject when SPISE started. Awards were given to the winning team of the entrepreneurship competition, and to the members of the Electronics team who demonstrated especially notable teamwork. The Motivational Award was

given to students who demonstrated significant academic growth in their courses, showing great potential for the highest academic performance. Spirit of the Class awards were also presented to those students who were engaged in class, showed an infectious enthusiasm through their active participation, helped motivate their classmates to master the material, and generally built group morale in the course through their very positive attitude and efforts. The prestigious John & Dorothy Herzog Award is the overall highest distinction in SPISE and was presented to the model SPISE student who demonstrated high overall academic performance in all courses and projects, showed leadership in activities and assignments, and assisted classmates gain mastery of the material. John and Dorothy Herzog were mentors and friends of Prof. Cardinal Warde, and he credits them with providing the guidance and impetus for him to pursue university studies in the U.S. Table IV below shows the list of award winners.

TABLE IV: Student Awards

Honey Advani	Most Improved – Calculus II, Most Improved – Computer Programming
Amariah Brathwaite	Most Improved – Calculus I, Spirit of Class – Physics I
Hale Fearon	Most Improved – Electronics
Daena Fontenelle	Most Improved – Biochemistry, Teamwork – Electronics
Aneira Garibsingh	Teamwork – Electronics, Competition Winner – Entrepreneurship
Maliyah Henry	Most Improved – Biochemistry
Kailey Ho	Top Performer – Calculus I
Alvin Htoot	Top Performer – Physics II
Rhianne Irving	Most Improved – Physics II, Competition Winner – Entrepreneurship
Arianna James	Top Performer – Calculus II, Spirit of Class – Physics II
Krishna Mahtani	Spirit of Class – Calculus II, Spirit of Class – Electronics, Teamwork – Electronics, Top Performer – Computer Programming, Competition Winner – Entrepreneurship
Johan Nah	Most Improved – Physics I, Spirit of Class – Biochemistry, Most Improved – Computer Programming
Arthur Roberts	Motivational Award
D'Aundré Samuel	Motivational Award
Jonathan Shaw	John and Dorothy Herzog Award, Top Performer – Biochemistry, Top Performer – Electronics
Marie-Thérèse St. Clair	Spirit of Class – Calculus I, Top Performer – Physics I
Gianna Stapleton	Motivational Award
Kennardo Taylor	Teamwork – Electronics
William Wright	Spirit of Class – Computer Programming
Joseph Yeung-Chou	Competition Winner – Entrepreneurship